HALIPLUS VARIOMACULATUS, A NEW SPECIES FROM EAST-CENTRAL ILLINOIS (COLEOPTERA: HALIPLIDAE)

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ABSTRACT

Haliplus variomaculatus is described on the basis of 40 specimens from east-central Illinois. A key and illustrations are provided to distinguish it from several similar species, especially *H. deceptus* Matheson, to which it keys in the most recent revision of the genus, and *H. triopsis* Say, which it most closely resembles. Water analysis data are presented for several adjacent ponds similar to those in which *variomaculatus* was collected. A section on ecology discusses the aquatic habitat and species diversity including *variomaculatus* and 10 associated species.

In the course of a survey of the aquatic Coleoptera of Illinois, the authors collected an undescribed species of *Haliplus* from stripmine ponds in east-central Illinois. It belongs to the subgenus *Paraliaphlus* as defined by Wallis (1933).

Haliplus (Paraliaphlus) variomaculatus
Brigham & Sanderson **NEW SPECIES**

Diagnosis. A medium-sized *Haliplus* with distinctly maculate elytra, medial dark blotch on the anterior portion of the pronotum, undarkened strial punctures, slightly constricted prosternal ridge, metasternum without foveae of any kind, unbeaded anterior pronotal margin, no pronotal plicae, elytron serrate in humeral region, apex of elytron serrate with serrations fading suturally, and digitus of left paramere of male genitalia more than 4 times longer than wide. Keys to *Haliplus deceptus* Matheson in Matheson (1912) and Wallis (1933). Superficially similar to *H. deceptus* and *H. triopsis* Say. From these it differs in the distinctive type of genitalia of the male as well as in differences in elytral pattern. The male genitalia are distinct from the known Nearctic species of *Haliplus* illustrated by Wallis (1933) and subsequently by Mank (1940), Leech (1948, 1957), Gordon and Post (1965), and Brigham and Sanderson (1972).

Haliplus variomaculatus keys to *H. deceptus* in Wallis (1933). Some difficulties are encountered beyond couplet 19, however, and the following modifications are necessary to include the new species:

20. Color testaceous or fulvous; punctulation moderate; maculation of elytra not or but little confluent or strongly confluent 21
—— Color usually markedly ferruginous; punctulation coarse and deep; maculation of elytra usually strongly confluent (goes to *H. punctatus* Aubé and *H. mutchleri* Wallis) 23

21. Aedeagus of male bent abruptly downward in apical fifth (Fig. 2C) ..... *H. triopsis* Say
—— Aedeagus of male almost evenly curved from base to apex (Fig. 1E) 22a

22a. Size larger, usually over 3.5 mm long; blotch on anterior margin of pronotum broad, tapering, approaching or exceeding width of base of head (Fig. 2A) ..... *H. pantherinus* Aubé
—— Size smaller, usually less than 3.25 mm long; blotch on anterior margin of pronotum square or oval, width usually less than width between eyes and never more than slightly greater than width between eyes (Fig. 1B) 22b

22b. Basal black border of elytron narrow; sutural stripe narrow, sometimes not even reaching subsutural row of small punctures; elytral blotches not or but little confluent; apex of right paramere of male genitalia broadly rounded (Fig. 2B), with a few fine setae, apical three-fifths with many fine punctures ..... *H. deceptus* Matheson
—— Basal black border (B) of elytra rather wide (Fig. 1A); sutural stripe frequently, though not always, attaining 1st row of strial punctures; elytral blotches frequently strongly confluent (Figs. 1A and 1C); apex of right paramere of male genitalia more sharply rounded (Fig. 1D), with a few strong setae, apical two-fifths with few punctures ..... *H. variomaculatus* new species

Holotype Male. Ovate, widest at or near the posterior margin of the posthumeral discal blotch (PoHD). Greatest width 1.83 mm; greatest length 3.23 mm.

Head. Maximum width of head through eyes 0.76 mm; minimum width of head between eyes 0.30 mm; punctures uniformly distributed on front and vertex except for a small impunctate area between posterior margins of eyes; eye ringed with narrow dark margin, rest of head testaceous (Fig. 1B).

Pronotum. Width at apex 0.76 mm; width at base 1.30 mm; length along midline 0.73 mm; discal punctation coarse behind anterior margin, finer elsewhere; impunctate area on each side of midline medially; scutellar region impunctate; dusky medial blotch anteriorly, rest of pronotum testaceous (Fig. 1B).

Elytra. Humeral margin serrate; apex serrate, serrations fading suturally; apex only slightly sinuate; strial punctures undarkened, pit-like, the rows uninterrupted; a row of fine punctures between the strial rows, regularly spaced; 2 rows of fine punctures between the 1st strial row and the sutural margin; elytral fuscous markings distinct against a testaceous background, less darkened anteriorly, distributed as follows (Fig. 1A): (1) basal border (B) of elytra fuscous from beyond 5th stria to suture, joining sutural stripe; (2) suture (S) with fuscous border which does not reach the 1st stria, but which reaches the 2 subsutural rows of punctures, expanded at apex into an arrowhead-like apical blotch (A); (3) medial basal blotch (MB) slightly longer than wide, extending from 3rd to 4th striae, joined to basal border; (4) medial sutural blotch (MS) longer than wide, joined to sutural stripe and extending to 2nd stria, extended toward premedial discal blotch (PrMD); (5) posthumeral discal blotch (PoHD) as wide as long, extending from 6th to 8th striae; (6) premedial discal blotch (PrMD) as wide as long, extending from 3rd

to 5th striae, extended toward medial sutural blotch (MS); (7) medial discal blotch (MD) longer than wide, extending from 4th to 6th striae, joined by narrow lobe to the postmedial discal blotch (PoMD); (8) postmedial discal blotch longer than wide, extending from 1st to 2nd striae, joined by narrow lobe to sutural stripe and to medial discal blotch (MD); (9) medial submarginal blotch (MSm) wider than long, extending from 7th to 10th striae; (10) postmedial submarginal blotch (PoMSm) longer than wide, extending from 7th to 10th striae. All blotches separated except as noted above. Blotch designations and abbreviations used above and in Fig. 1A follow Brigham and Sanderson (1972) except that their final "b" was dropped here in the abbreviations (example: medial sutural blotch, their msb, becomes MS), and their basal blotch, bb, has been redesignated the medial basal blotch, MB.

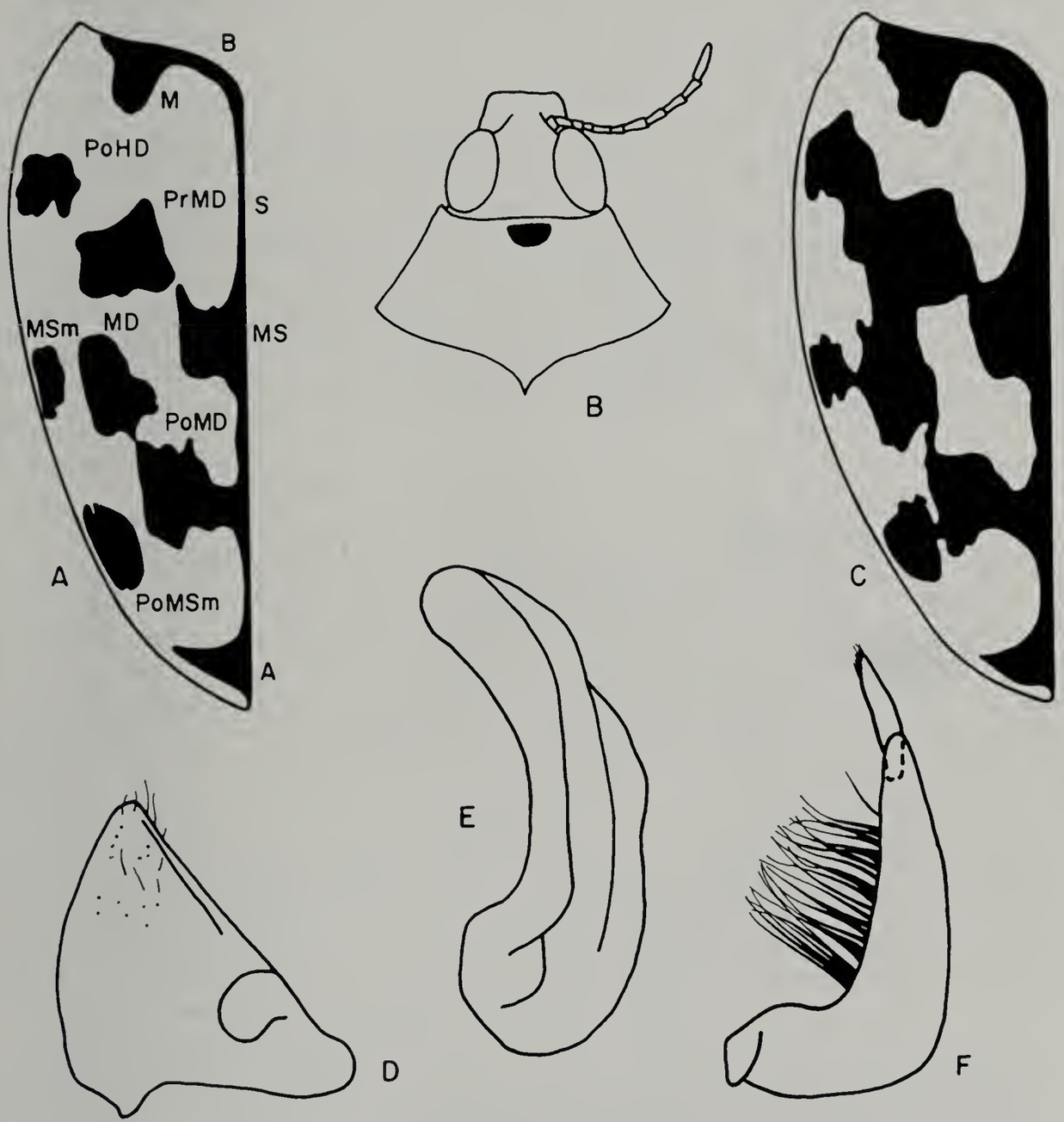

Fig. 1. *Haliplus variomaculatus* new species, holotype male: A. left elytron: B. head and pronotum, dorsal aspect; male genitalia: D. right paramere; E. aedeagus; F. left paramere. Paratype female: C. left elytron.

Venter. Width of prosternum at apex 0.33 mm, at base 0.32 mm, at constriction between front coxae 0.27 mm, obscurely margined, punctures coarser laterally; apex of metasternal process depressed, below base of prosternal process, with an impunctate area medially, without pits or foveae of any kind; last sternite impunctate anteriorly, with a few coarse punctures posteriorly; hind coxa rounded posteriorly, punctures becoming finer and more abundant posteriorly; trochanter of middle leg impunctate, shining; internal face of posterior tibia without longitudinal setigerous striole; basal 3 segments of fore and middle tarsae each enlarged toward apex, the inner apical angles somewhat produced, middle 3 segments densely set with specialized setae; entire venter testaceous except prosternal and metasternal processes, joints of legs, and tarsae which are ferruginous.

Genitalia. Aedeagus (Fig. 1E) about 4 times longer than wide, dorsal lobe continuing along three-fourths of aedeagus, a 2nd lobe continues almost to apex, entire aedeagus curving ventrally from base to apex; right paramere (Fig. 1D) triangular, longer than wide, convex on outer margin, apex sharply rounded, with a few strong setae, apical two-fifths with a few punctures; left paramere (Fig. 1F) concave on inner margin, with long setae, digitus more than 4 times as long as wide, with a dense tuft of setae at the oblique apex.

Allotype Female. Similar to holotype except in color pattern which varies as follows: basal border of elytron and pronotal blotch less darkened and less clearly defined; postmedial discal blotch free from sutural stripe and from medial discal blotch; medial sutural blotch joined to premedial discal blotch by a narrow lobe; fore and middle tarsae lack specialized setae; and basal 3 segments of fore and middle tarsae not produced at the inner apical angles. Size of allotype almost exactly that of holotype.

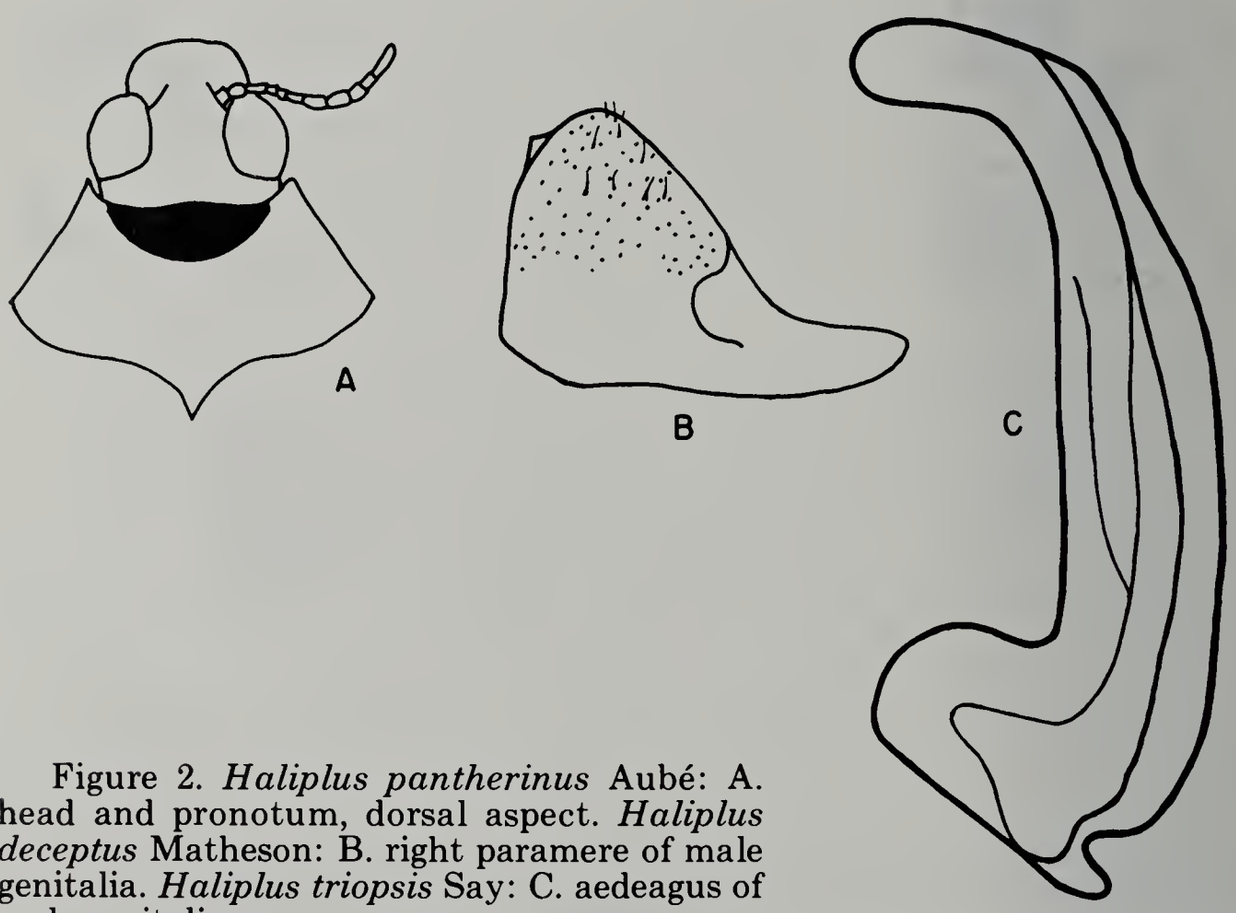

Figure 2. *Haliplus pantherinus* Aubé: A. head and pronotum, dorsal aspect. *Haliplus deceptus* Matheson: B. right paramere of male genitalia. *Haliplus triopsis* Say: C. aedeagus of male genitalia.

Types: Holotype male, allotype female, and 1 male and 4 female paratypes: ILLINOIS, Vermilion County, Kickapoo State Park, pond west of Deep Lake, 18-VI-71, Brigham and Sanderson [Illinois Nat. Hist. Survey]; 6 male and 5 female paratypes: same locality as holotype but 3-VIII-71, Brigham and Sanderson [Illinois Nat. Hist. Survey, Nat. Mus. Nat. Hist., Field Mus. Nat. Hist.]; 4 male paratypes: same locality as holotype but 30-VIII-71, Brigham and A. Gnilka [Illinois Nat. Hist. Survey]; 5 male and 8 female paratypes: a 2nd pond adjacent to type pond, 3-VIII-71, Brigham and Sanderson [W. U. Brigham]; 5 male paratypes: same locality but 30-VIII-71, Brigham and A. Gnilka [W. U. Brigham].

TABLE 1. PHYSICAL AND CHEMICAL CHARACTERISTICS OF 40-YEAR-OLD STRIPMINE PONDS IN KICKAPOO STATE PARK, VERMILION COUNTY, ILLINOIS (SAMPLES FROM 1 M DEPTH).

Parameter	Location		
	Deep Lake	High Lake	Pond No. 6
Total dissolved ionized solids (mg/1)	1378	425	786
pH	7.8	7.9	7.0
Total alkalinity (mg/1 as $CaCO_3$)	140	158	298
Calcium (mg/1 as $CaCO_3$)	472	88	169
Magnesium (mg/1 as $CaCO_3$)	496	161	161
Total hardness (mg/1 as $CaCO_3$)	968	249	330
Silicate (mg/1 as Si)	0.68	4.94	2.34
Orthophosphate (mg/1 as PO_4)	0.02	18.64	0.10
Polyphosphate (mg/1 as PO_4)	22.38	6.96	23.20
Sulfate (mg/1)	1073	82.8	207
Turbidity (JTU)	2.7	1.4	5.5

Ecology. The type series of *Haliplus variomaculatus* was taken from 2 stripmine ponds in Kickapoo State Park, Vermilion County, Illinois. Most specimens were taken from a small bay (2 m wide and 0.5 m deep) of 1 pond with a fine-mesh dipnet. Submerged vegetation here consisted of *Nitella, Potamogeton,* and *Veronica.* Emergent grasses predominated along the periphery of the pond. The 2nd pond contained no *Nitella,* but did contain the related genus *Chara.* Both ponds contained the filamentous alga *Oedogonium.*

While no water analyses were performed on the ponds from which the haliplids were taken, analyses have been performed on stripmine ponds of similar age (approximately 40 years) in the immediate area. These data are believed to reflect the constitution of most of the ponds of that age in the park. Results of these analyses are reproduced in Table 1 to give a more complete picture of the habitat of *Haliplus variomaculatus.*

Little information has been published regarding species associations of Haliplidae. Wilson (1923) reported 2 species of haliplids occurring together in fishponds at Fairport, Iowa. Brigham and Sanderson (1972) found 6 species of haliplids among 41 species of aquatic beetles from a cemetery pond in Niles, Cook County, Illinois. It is therefore notable that 11 species of Haliplidae were taken from a single small bay in 1 of the stripmine ponds reported on here. Results of these collections appear in Table 2.

TABLE 2. HALIPLIDAE TAKEN FROM STRIPMINE PONDS IN KICKAPOO STATE PARK, VERMILION COUNTY, ILLINOIS, DURING 1971.

Species	18-VI-71	3-VIII-71	30-VIII-71
Haliplus borealis LeConte	13	78	24
H. connexus Matheson	0	0	3
H. pantherinus Aubé	0	2	0
H. tortilipenis Brigham and Sanderson	0	2	0
H. triopsis Say	15	28	40
H. variomaculatus new species	7	24	9
Peltodytes edentulus (LeConte)	6	21	21
P. lengi Roberts	3	8	5
P. litoralis Matheson	0	1	1
P. muticus (LeConte)	0	1	0
P. sexmaculatus Roberts	4	24	44
Total	48	189	147

Ascomycete fungi (Laboulbeniales) were noted on the ventral surfaces of 2 of the 24 specimens of *Haliplus variomaculatus* collected on 3-VIII-71. These fungi have been referred to *Hydraeomyces halipli* (Thaxt.) Thaxter by R. K. Benjamin (pers. comm.).

Variation. Gross variation within the type series of *Haliplus variomaculatus* is limited to the elytral maculation. Location and intensity of the blotches appear to be nearly constant, with variation apparent only in the shape of and the degree of coalescence of the blotches. The male genitalia showed insignificant variation in all individuals. Males and females showed some differences in length and width: 22 males ranged in length from 3.1 mm to 3.6 mm (mean length 3.38 mm), and in width from 1.8 mm to 2.0 mm (mean width 1.86 mm); 18 females ranged in length from 3.1 mm to 3.5 mm (mean length 3.30 mm), and in width from 1.8 mm to 2.0 mm (mean width 1.89 mm). Dividing width by length gave a mean value of 0.552 for males and 0.572 for females.

Little significance is attached to the shape of the elytral blotches. Extremes of coalescence are illustrated in Figures 1A and 1C. The 80 elytra in the type series were segregated according to the extent of blotch coalescence into 17 different patterns. It is significant that only 16 of the 40 specimens were symmetrical with regard to elytral pattern.

All elytral patterns showed coalescence of the medial basal blotch (MB) to the basal border of the elytra (B), the medial sutural blotch (MS) and the apical blotch (A) to the sutural stripe (S), and, except for the left elytron of the holotype, the premedial discal blotch (PrMD) to the medial sutural blotch (MS) (Figs. 1A and 1C). The 17 elytral patterns are described in Table 3. Abbreviations for the blotches are as in Figure 1A and in the description of the holotype. Patterns No. 1 and No. 14, the extremes, are illustrated in Figures 1A and 1C, respectively.

TABLE 3. BLOTCH-COALESCENCE DIFFERENCES AMONG THE 17 ELYTRAL PATTERNS FOUND IN THE TYPE SERIES OF *Haliplus variomaculatus* NEW SPECIES (ABBREVIATIONS DEFINED IN TEXT AND ILLUSTRATED IN FIG. 1A).

	Pattern Number																
Coalesced Blotches	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
PoMD and S	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
PoHD and PrMD			*		*	*	*	*	*	*			*	*	*		*
MD and PrMD			*	*		*	*	*	*	·	*		*	*			
PoMD and PoMSm						*	*			*			*	*			
MD and MSm						*		*						*	*	*	
MD and PoMD	*								*		*	*	*	*			
Number of elytra (of 80) with pattern	1	18	15	11	6	5	4	4	3	2	2	2	2	2	1	1	1
Number of occurrences in symmetrical individuals (of 16)	0	5	4	3	0	1	1	0	1	1	0	0	0	0	0	0	0

Coalescence indicated by the symbol "*".

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